



# 4-CB

## Introducing 4-state Customer Barcode

*An Alternative for Confirm® PLANET Code*

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### **Disclaimer**

Information conveyed in this document is preliminary. None of the potential applications of 4-state Customer Barcode under consideration has been finalized and will certainly undergo modification before final implementation. U.S. Postal Service reserves the right to change the information conveyed in this document without prior notice.

## TABLE OF CONTENTS

<b>1</b>	<b>PROGRAM OVERVIEW</b>	<b>2</b>
1.1	Background	2
1.2	Challenges	2
1.3	Advantages of 4-State Customer Barcode (4-CB)	3
1.4	Approximate Timeline	4
<b>2</b>	<b>4-STATE CUSTOMER BARCODE SPECIFICATIONS</b>	<b>5</b>
2.1	Review of POSTNET and PLANET Code	5
2.2	<b>4-state Customer Barcode</b>	<b>6</b>
2.2.1	<i>Barcode Symbology</i>	6
2.2.2	<i>Print Specifications</i>	7
2.2.3	<i>Clear zone</i>	8
2.2.4	<i>Barcode Tilt</i>	9
2.2.5	<i>Data Encoding</i>	10
2.2.6	<i>Barcode Placement</i>	10
2.3	<b>Data Payload</b>	<b>11</b>
2.3.1	<i>Barcode Id</i>	11
2.3.2	<i>Service Codes</i>	11
2.3.3	<i>Subscriber ID</i>	12
2.3.4	<i>Unique ID</i>	12
2.3.5	<i>Routing ZIP</i>	12
<b>3</b>	<b>SCAN RECORD FORMAT</b>	<b>13</b>
3.1	Mail piece Scan Record Format	13
3.2	Mail piece Scan Records	13
<b>4</b>	<b>ADDITIONAL INFORMATION</b>	<b>14</b>
4.1	CONTACT	14
4.2	DISCLAIMER	14

# 1 Program Overview

## 1.1 Background

With Intelligent Mail as a key strategy of the US Postal Service Transformation Plan, the Postal Service adopted the following Intelligent Mail Vision in 2003.

*The Postal Service and its customers capitalize on the value of information about mail by placing a standardized, information-rich code on all mail to enable end-to-end visibility into the mail stream.*

The Postal Service has identified three key strategies to achieve the Intelligent Mail Vision:

*Uniquely Identify Mail and Unit Loads*

*Develop and Deploy Enabling Infrastructure*

*Enhance Address Quality*

The Postal Service is committed to work with the mailing community to ensure that all mail can be uniquely identified and tracked so as to provide value-added services to postal customers and improve mail service.

## 1.2 Challenges

There can be many barcodes on letters and flats today, as depicted in the following illustration.



The Postal Service and its customers have been using the POSTNET Code since the 1980s to encode 5, 9, or 11-digit delivery-point code. In the 1990s, PLANET Code was introduced to enable tracking of letter and flats through the Confirm® program, and Special Services barcodes were introduced to track mail that subscribes to special services, such as Delivery Confirmation™ and Certified. The need to apply separate barcodes for different services encroaches the aesthetic and available real estate on the mail and presents a challenge to the mailers.

For Confirm® users, the 13-digit<sup>1</sup> PLANET Code limits each mailer to 1 million unique serial numbers. The Postal Service is keenly aware that this is inadequate for a larger mailer who could enter more than 1 million pieces of mail in any given day. The Postal Service has therefore begun to develop more advanced coding standards that can significantly increase the amount of information carried but requiring only minimal increase in space on the mail piece.

### 1.3 Advantages of 4-State Customer Barcode (4-CB)

Two types of advanced barcodes were considered as potential alternatives to PLANET Code.

- 4-CB



- 2D Barcode



PDF417  
(2D Stacked)



Data Matrix  
(2D Matrix)

The 4-CB is similar to the existing POSTNET Code and PLANET Code. They belong to the class of height-modulated barcode. While POSTNET and PLANET Codes use tall bars and short bars to encode data, 4-CB uses tall bars, and short bars at 3 different vertical positions so that more information can be encoded in about the same amount of space. It has been estimated that a 4-state barcode that encodes 31 digits would have the same length as, and only 35% taller than, a 11-digit POSTNET Code. Detailed specifications of can be found in the next chapter.

2D barcodes are more complex code, using 2-dimensional spatial distribution of pixels to encode information. 2D barcodes have higher information carrying capability than 4-state barcodes. The Postal Service permits the use of 2D barcode for postage indicia imprint in conjunction with online postage payment and on new postage meters.

Several other Postal Administrations developed the 4-state barcode after the Postal Service implemented the POSTNET code. Preliminary tests conducted by the Postal Service have demonstrated that the 4-state barcode has a higher read rate than POSTNET and PLANET Code.

But the most important consideration in deciding between 4-state barcode and 2D barcode is mailers' ability to print. Accordingly, as part of the decision process to choose between 4-state barcode and 2D barcode, a mailer's technology study was conducted in 2003 to understand the mailing industry's potential to print more advanced barcodes. Over 300 mailers that represent all customer account types and industry segments were interviewed. The study found that 59% of the mailers interviewed use inkjet technology and 32% use laser technology for printing barcode. Inkjet and laser technologies can be easily converted to print 4-state barcode with minimal software changes. Therefore, more than 90% of the mailers are already equipped to adopt 4-state barcode. On the other hand, a majority of the mailers would have to invest in more advanced printing technology in order to adopt 2D barcode. The Postal Service is therefore moving forward with offering 4-CB as an alternative to PLANET Code for Confirm® services for letters and flats.

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<sup>1</sup> The length of 13 does not include the check digit. Reader of this document is assumed to be familiar with the Confirm® service. Additional information can be found in Publication 197, Confirm User Guide, which can be obtained at [www.mailtracking.usps.com](http://www.mailtracking.usps.com).

## 1.4 Approximate Timeline

The development of the decoding software to read 4-CB is already underway. The capabilities to read 4-CB will be enabled on letter and flat sorters along with the deployment of ongoing Engineering programs. For letter mail equipment, 4-CB reading is being incorporated into the wide field-of-view camera program. For flat sorting equipment, it is being incorporated into the flats ID Code sort system, which is expected to be completed in late 2005.





















As listed below, a series of tests are in progress to ensure the success of reading 4-CB on letters and flats. Some of the tests and their anticipated dates are listed here:

February '04	Computer simulated testing of decoding software (completed)
April '04	Testing encoding software with mailers (completed)
April '04	Lab testing on a letter mail sorter using test decks (completed)
June '04	Testing readability on USPS internally generated letter mail (completed)
Early '05	Live letter mail testing with one Confirm® mailer
Fall '05	Live mail testing on flats

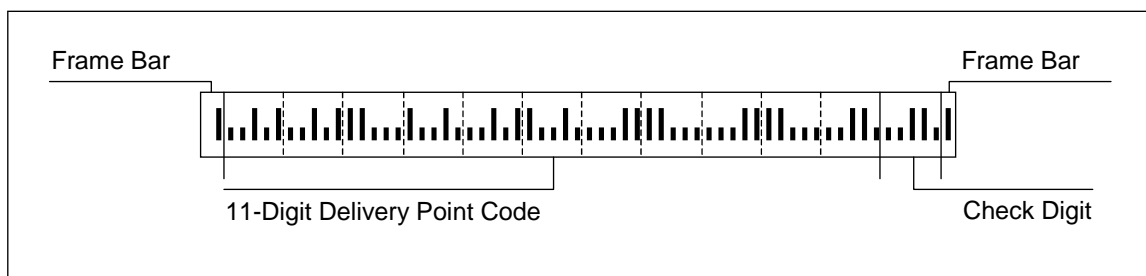
## 2 4-State Customer Barcode Specifications

### 2.1 Review of POSTNET and PLANET Code

POSTNET and PLANET Codes are height-modulated linear barcodes that use the height of regularly spaced bars to encode numeric information. In POSTNET Code, each digit is encoded by 5 bars, two of which are tall bars, and the remaining three are short bars. In PLANET Code, each digit is also encoded by 5 bars, three of which are tall bars, and the remaining two are short bars. The representation of the numerals in POSTNET and PLANET Codes are shown in the following table.

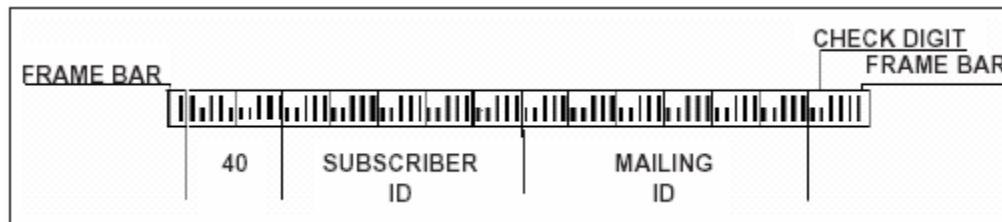
POSTNET		PLANET
	0	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	

The POSTNET Code consists of 5, 9, or 11 digits for the delivery point code, followed by a check digit. The entire string is preceded and followed by a frame bar, which is a tall bar. See the illustration below.



The PLANET Code for Confirm® consists of a 2-digit service code, a 5-digit subscriber ID identifying the mailer, and a 4- or 6-digit mailing ID for identifying the mail piece, followed by a check digit. Like the

POSTNET Code, there is a tall bar at the beginning and the end of the barcode. See the illustration below, which shows a 6-digit mailing ID.



## 2.2 4-state Customer Barcode

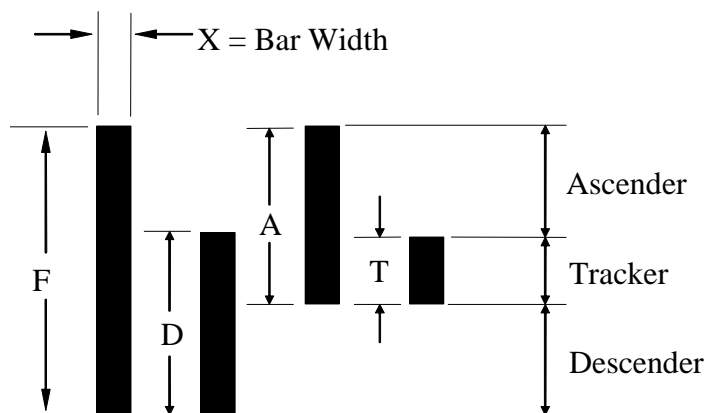
The 4-CB is a height-modulated barcode designed for use in high speed, automated, mail sortation machines that allow both the PLANET Code and POSTNET barcode information to be combined into a single barcode with expanded tracking capability.

### 2.2.1 Barcode Symbology

The 4-CB is a height-modulated barcode using four distinct, vertical bar types. Each bar type consists of one or a combination of the following elements:

Tracker  
 Ascender and  
 Descender

as shown in the following illustration.

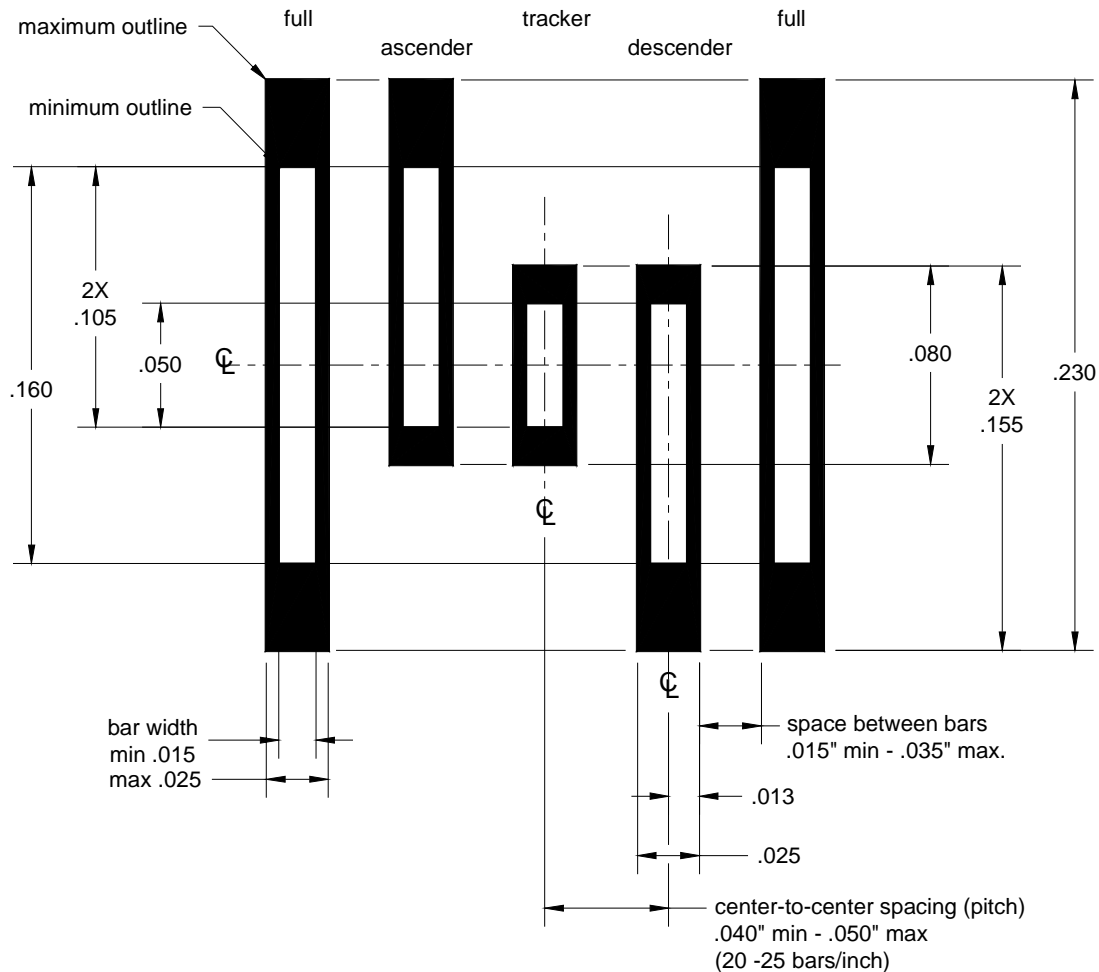


The Tracker element is present in all bars. Some bars may have Ascenders or Descenders. The Full height bar (F) consists of the Tracker, Ascender and Descender. The following table defines the bar types in terms of the elements that make up each bar type.

Bar Type	Elements
T – Tracker	Tracker
D – Descender	Tracker, Descender
A – Ascender	Tracker, Ascender
F – Full Height	Tracker, Ascender, Descender

### 2.2.2 Print Specifications

Below are the preliminary specifications of the minimum and maximum dimensions for the 4-CB. The US Postal Service will conduct an evaluation of different bar sizes before a determination is made on the final specifications.



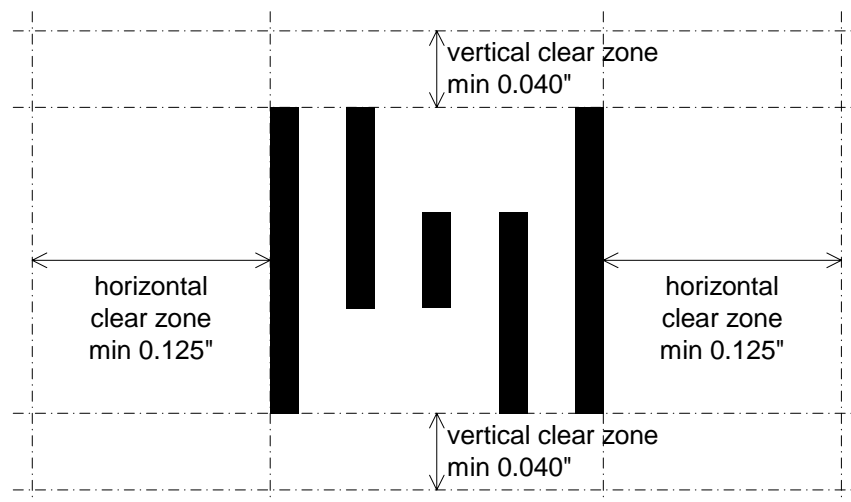


Vertical dimensions are based on the centerline of the barcode, based on an overall barcode height of 0.16" – 0.23". Any vertical jitter must be contained within the vertical dimensions from the centerline. Horizontal dimensions are based on the centerline of the individual bars, based on an overall barcode pitch of 20–25 bars/in. The pitch must be constant throughout the entire barcode to ensure proper interpretation. Individual bars must be printed with a width of 0.015" to 0.025". The pitch and widths result in a spacing between bars of 0.015" to 0.035".

The specification allows a range on all dimensions. This variation accommodates various printers and techniques. For printing, a barcode must be printed uniformly over its entire area, maintaining consistent (within  $\pm 10\%$ ) pitch, bar rotation, bar width, centerline and vertical dimensions. Greater uniformity improves barcode interpretation resulting in proper routing and tracking.

### 2.2.3 Clear zone

A clear zone is required around the barcode to ensure that the barcode readers can locate and read the barcode. A minimum clear zone of 0.040" is required above and below the barcode. A minimum clear zone of 0.125" is required on each end of the barcode. Clear zones are shown below.



## 2.2.4 Barcode Tilt

When printing 4-state barcodes, two types of tilt can occur:

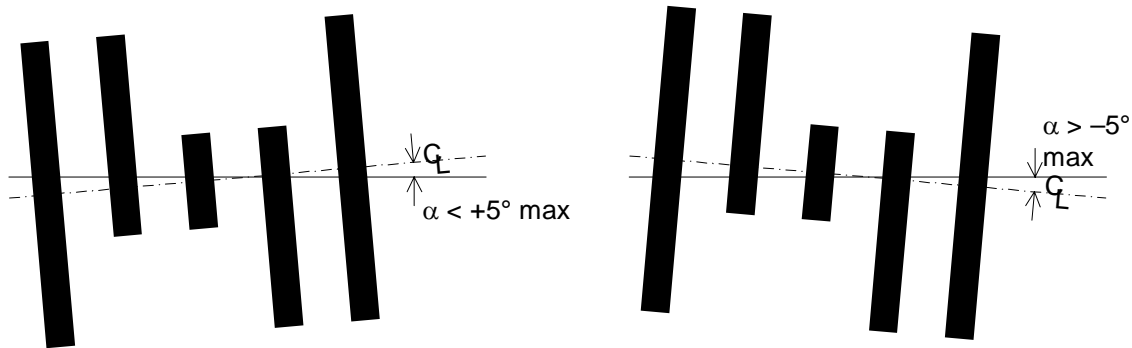
- barcode skew, in which the entire barcode is skewed with respect to the bottom edge of the mail piece
- bar rotation, in which the individual bars are rotated with respect to the centerline of the barcode

Both types of tilt may occur simultaneously.

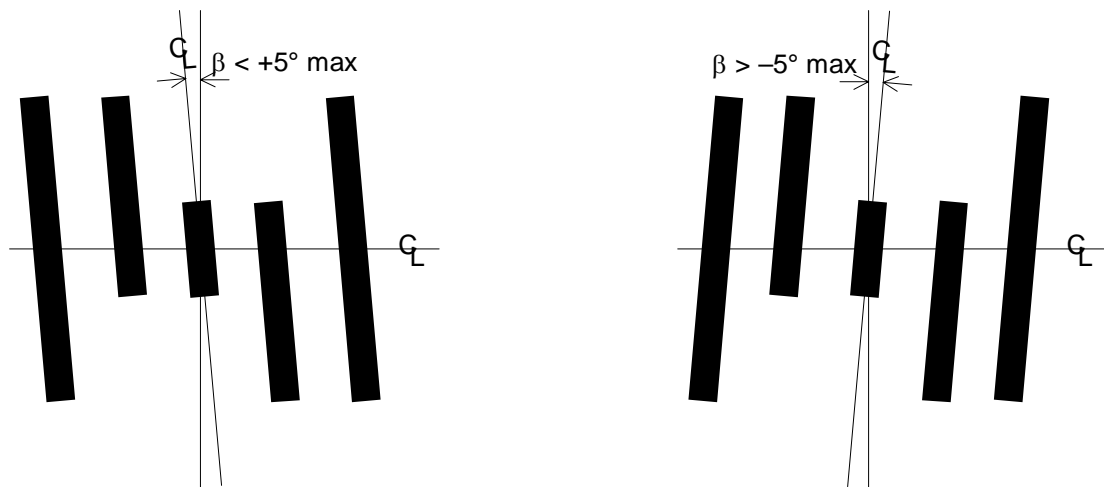
Barcode skew must be limited to  $\pm 5^\circ$ , as shown in the figure “Barcode Skew” below.

Bar rotation must be limited to  $\pm 5^\circ$ , as shown in the figure “Bar Rotation” below.

The total tilt must be limited to  $\pm 5^\circ$ ,  $|\alpha| + |\beta| < 5^\circ$ .



**Barcode Skew**



**Bar Rotation**

### 2.2.5 Data Encoding

Encoding data into a POSTNET or PLANET Code is very straightforward: each digit in the data payload is represented by a predefined pattern of 5 bars. Encoding data into a 4-CB is more complex. The data payload is a fixed-length array of 31 base-10 digits. An encoding algorithm translates these 31 digits into randomized 65 bars.

For example, the payload

tracking = 01234567094987654321, routing = 01234

will be encoded into a series of 65 bars, each represented in the following string by a letter that designates the bar type. (D=Descender, A=Ascender, etc.)

DTTAFADDTTFTDTFTFDTDADADAFADFATDDFTAAAFDTTADFAAATDFDTDFADDDTDFFT

The actual barcode will look like this:



This document does not describe the exact algorithm for encoding. However, the US Postal Service will provide encoding software to the mailing community for generation of 4-CB.

Because of the complexity of encoding, the 4-CB does not lend itself to easy manual decoding.

### 2.2.6 Barcode Placement

4-CB may be applied as shown in the following example. Dimensional requirements are not defined at this time. The expected location is above the address block. Upon initial implementation of 4-CB, it is anticipated that customers will be required to provide Delivery Point ZIP Code in the POSTNET Code and the 4-CB. After a period of transition, the Postal Service will allow the omission of the POSTNET Code.

EXAMPLE 1: Placement of the 4-CB above the address block, with the POSTNET barcode located below the address.



Jessica H. Jones  
2990 Pittsburgh Drive  
Anytown, DC 01234-5678



## 2.3 Data Payload

The following table shows the preliminary payload layout for the 4-CB. Side-by-side comparison with POSTNET and PLANET Code is also provided.

Field	4-CB	POSTNET	PLANET
Barcode ID	2 (2 <sup>nd</sup> digit must be 0–4)	0	0
Service	3	0	2
Subscriber ID	6	0	5
Unique ID	9	0	6
Routing ZIP	None, 5, 9, 11	5, 9, 11	0
<b>Total Max Digits</b>	<b>31</b>	<b>11</b>	<b>13</b>

### 2.3.1 Barcode Id

All 4-CBs begin with a 2-digit Barcode Identifier that identifies the barcode for internal Postal Use Only. This is two digits, with the second digit in the range of 0–4. Thus, valid values are 00–04, 10–14, 20–24, 30–34, 40–44, 50–54, 60–64, 70–74, 80–84 and 90–94. Barcode Identifiers will be defined in the future by the US Postal Service.

### 2.3.2 Service Codes

All 4-CBs contain a 3-digit Service Code field that identifies the type of service or product. The current PLANET Code has a 2-digit Service Code. In the long run, the expanded service code is intended to allow a single 4-state Barcode to support multiple services in addition to or instead of Confirm®.

The following table shows the list of service codes for Confirm®. It allows for current 2-digit Confirm® Service Codes to be used with the addition of a preceding zero.

SERVICE CODE FOR DESTINATION CONFIRM SERVICE	
022	DESTINATION (RESIDUAL MAIL)
040	DESTINATION (FIRST CLASS LETTERS)
041	DESTINATION (FIRST CLASS FLATS)
042	DESTINATION (STANDARD MAIL LETTERS)
043	DESTINATION (STANDARD MAIL FLATS)
044	DESTINATION (PERIODICAL LETTERS)
045	DESTINATION (PERIODICAL FLATS)
046	DESTINATION (FIRST-CLASS MAIL CARDS)
047	DESTINATION (STANDARD MAIL CARDS)

<b>SERVICE CODE FOR ORIGIN CONFIRM SERVICE</b>	
021	ORIGIN (MISCELLANEOUS)
050	ORIGIN (COURTESY REPLY LETTERS)
051	ORIGIN (COURTESY REPLY FLATS)
052	ORIGIN (BUSINESS REPLY LETTERS)
053	ORIGIN (BUSINESS REPLY FLATS)
054	ORIGIN (BUSINESS REPLY CARDS)
056	ORIGIN (QBRM LETTERS)
057	ORIGIN (QBRM CARDS)
058	ORIGIN (COURTESY REPLY CARDS)

The initial list of service codes offered for 4-CB will be the Confirm® service codes that identify mail class only. These service codes are listed below.

<b>SERVICE CODE FOR DESTINATION CONFIRM SERVICE</b>	
040	DESTINATION (FIRST CLASS)
042	DESTINATION (STANDARD MAIL)
044	DESTINATION (PERIODICAL)

<b>SERVICE CODE FOR ORIGIN CONFIRM SERVICE</b>	
050	ORIGIN (COURTESY REPLY)

As multiple services are defined for 4-CB, additional service codes for Confirm® will be identified.

### *2.3.3 Subscriber ID*

In the 4-CB, the subscriber ID has been expanded to 6 digits to accommodate future growth. Until the final specifications are released, Confirm® customers should append their current subscriber ID with a preceding zero.

### *2.3.4 Unique ID*

The Unique ID is a 9-digit field for use by the mailers. This field has been expanded to allow large mailers to use unique ID on each piece of mail.

### *2.3.5 Routing ZIP*

The Routing ZIP Code field will accommodate 5, 9 or 11 digit ZIP Code information. This field must contain only the Delivery Point ZIP Code for the addressee. DO NOT fill this field with preceding or trailing zeros.

Upon initial implementation of 4-CB, it is anticipated that Confirm® customers will be required to provide Delivery Point ZIP Code in the POSTNET Code and the 4-CB. After a period of transition, the Postal Service will allow the omission of the POSTNET Code.

### 3 Scan Record Format

Confirm® generates data that reflect the induction and automated processing of mail that has a 4-CB. When mail that has a 4-CB is scanned by the Postal Service's high-speed mail processing equipment, comma-delimited raw scan data records are created. The scan records that are produced during sort operations allow customers to interpret the data and estimate when mail pieces are near delivery. 4-CB raw scan data files will be separate from the existing PLANET Code raw scan data files received today.

#### 3.1 Mail piece Scan Record Format

The mail piece scan record represents where, when, and at which operation level an individual mail piece from a shipment is processed. This type of scan record is generated when a mail piece is processed on mail processing equipment barcode sorters. A mail piece is likely to generate multiple mail piece scan records as it is processed on automated equipment prior to delivery. However, the Postal Service cannot guarantee that every Confirm® mail piece with a 4-CB will receive a scan. The table below provides the format of the raw mail piece scan records.

Position	Name	Description
1-5	Facility ID	The 5-digit number representing the facility where mail was processed
7-9	Operation ID	The code that indicates the level of sort operation mail was processed
11-29	Scan Date & Time	The date (mm/dd/yyyy) and time (hh:mm:ss) the mail was processed
31-41	Routing ZIP Code	The Destination ZIP Code used to process the mail piece (5, 9, or 11 digits)
43-62	4-CB Tracking	The 20 digit for Confirm® Service

**Note:** A list of facility IDs can be obtained by contacting Confirm® Customer Support at 800-238-3150. The list of 3-digit operation codes is available in electronic format on the Confirm Web site at [mailtracking.usps.com](http://mailtracking.usps.com).

#### 3.2 Mail piece Scan Records

Below is an example of the 4-CB raw data file. All columns are separated by commas:

```
22081,896,12/29/2004 11:20:50,20155174817,11022022010990019102
22081,896,12/29/2004 11:20:50,20155174817,11022022010990019101
22081,896,12/29/2004 11:20:50,20155174817,11040022010990019104
22081,896,12/29/2004 11:20:50,20155174817,11040022010990019103
22081,896,12/29/2004 11:20:50,20155174817,11041022010990019106
```

## **4 Additional Information**

### **4.1 CONTACT**

For further information about 4-CB, please contact:

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### **4.2 DISCLAIMER**

All of the potential uses of the 4-CB described in this document are preliminary. None of the applications under consideration are finalized, and will certainly undergo modification before final implementation.